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PEROXIDE OF HYDROGEN

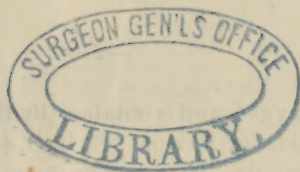
IN SUPPURATIVE CONJUNCTIVITIS
AND MASTOID ABSCESSSES, WITH
A REPORT OF TWO CASES.

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PEROXIDE OF HYDROGEN IN SUPPURATIVE CONJUNCTIVITIS AND
MASTOID ABSCESSSES, WITH A REPORT OF TWO CASES. By A. E.
PRINCE, M. D., of Jacksonville, Ill.

Feeling that the merits of peroxide of hydrogen as a *cleansing agent in suppurating cavities* are not sufficiently appreciated by the medical public, I am prompted to make a few remarks concerning its action, report a case of gonorrhœal ophthalmia and suggest a purpose for which it has, perhaps, not heretofore been employed, viz., the treatment of mastoid abscesses.

Anyone having no practical familiarity with this singular and inexpensive agent, will be well repaid for obtaining a small quantity and repeating a few startling, yet simple chemical experiments, which will illustrate the activity and utility of the article.

Since its discovery by Thenard, in 1818, it claimed the attention of none but the professional chemist, until it was taken up as a remedy for various constitutional diseases, among which diabetes and phthisis figure most prominently, and which were supposed to be influenced by the peroxide, on the hypothesis of antagonism between the life-giving principle of nascent oxygen and the devitalizing tendency of disease. It appeared, only to go into temporary oblivion after exhausting the enthusiasm of its exponents, who used it extensively and submitted it to the profession with highest praises; for its supposed medicinal virtues were based upon false theory, and the vaunted cures were not substantiated when subjected to the dispassionate observation of those, who were uninfluenced by hypothetical predilections in its favor. It is as a *local therapeutic agent* that it has asserted its supremacy, and secured the attention of medical pioneers in all departments of medicine.

The reader will be made intelligent by a glance at the substance itself, after which he will appreciate its applications. Physically it is like water, transparent, colorless, limpid, odorless and tasteless, with sp. gr. 1.452, remaining liquid at zero. Chemically it is one molecule of water connected by a feeble bond of affinity

to an atom of oxygen, and is obtained by the action of hydrochloric acid on peroxide of barium: $\text{BaO}_2 + 2\text{HCl} = \text{Ba Cl}_2 + \text{H}_2 \text{O}_2$. To its *instability* does it owe its importance as a therapeutic agent. In the presence of a variety of substances, as gold, silver and platinum, fibrin and cellular tissue, it is decomposed into water and oxygen, becoming at the same time a powerful oxidizer. Sugar and starch are decomposed with the development of carbon dioxide. Albumen, gelatin, urea and cutaneous tissues have no effect on it; while another class of bodies, as ammonia, hydrocyanic acid, tobacco and aconite, absolutely increase its stability and restrain its oxidizing influence on other substances. The injection of a small quantity into venous or even clotted blood produces a phenomenal demonstration, for the immediate liberation of the gas tears up the clot and liberates the corpuscles from their fibrinous connection, while it converts the venous character into the appearance of arterial blood, which remaining in the solution, becomes gradually more and more transparent.

The microscopic examination of clotted blood is greatly facilitated, and we venture to suggest that in this relation the peroxide of hydrogen may become of value in the department of forensic medicine. The fact that most concerns us, is the remarkable power possessed by a drop of pus to decompose this agent with the liberation of nascent oxygen, which directly adheres to and attacks all the adjacent tissue for which it has an affinity, and it thus becomes a powerful bacterial destroyer. In volume the liberated gas is twelve times that of the peroxide employed, and its influence on the pus is most easily of microscopic demonstration.

As an antiseptic this is far inferior to iodoform, with which it has the inestimable quality in common, of producing little or no irritation, when used about tender organs. Yet it is armed with a quality which gives it pre-eminence over all other antiseptics, and destines it to a position of prominence in the armamentarium antisepticum. The difficulty under which antiseptic medicaments have labored, has been the impossibility of successfully applying the agent in an unirritating form, so that it might come in contact with and destroy the disease germs, and it is in surmounting this difficulty in the department of dentistry, that this unique quality has been brought before our attention. Among the difficulties with which the dentist has been obliged to contend, is the management of alveolar abscesses, situated, as they are, at the bottom of the alveolar cavity and accessible only through

the root canal of the tooth. In peroxide of hydrogen the dentist has found an effective remedy, and its use in this connection forms so excellent an illustration of the properties of this agent, that it seems of some importance to give it in this connection.

Alveolar abscesses are essentially septic in their nature and originate, usually, from decaying pulps, and the familiarity of every practitioner with their chronicity and inaccessibility needs no mention to cause him to appreciate their obstinacy and the commensurable efficiency of peroxide of hydrogen, by which the septic condition of the cavity is destroyed and the abscess caused to heal by one application made in the following manner: After removing the pulp and passing a broach through the canal of the root into the abscess cavity, a drop of the liquid is injected by means of Farrar's syringe. The cavity of the crown is then immediately closed with softened gutta-percha, before which, under pressure of the finger, the liquid is driven into the abscess cavity. Upon coming into contact with the pus in the fœtid cavity, the liberated gas permeates it throughout, and by the continued evolution of the gas the cavity is emptied of its contents, which boil out at the fistulous opening so thoroughly mixed that the appearance is that of foam or froth; while the remnant not thus removed is rendered so thoroughly antiseptic that the healing process proceeds uninterruptedly. This result is by some attributed to the cleansing quality alone, claiming that its antiseptic properties are so weak as to be scarcely taken into account. However this may be, it will not be denied that it fills an important place in ocular and aural therapeutics, as illustrated by the following two cases, which are types of classes in each of these departments, the disastrous consequences of which are but too frequent in the present state of our knowledge.

CASE I.—Mr. —, Waverly, Ill., æt. 22, gonorrhœal ophthalmia of right eye. Thus far the other had not become affected and steps were taken to prevent its contamination. The lids were swollen and somewhat cedematous, while the chemotic condition of the conjunctiva caused the upper third of the cornea to be absolutely concealed from view. Touched with a probe in attempting to inspect the underlying corneal surface, this red polypoid projecting tissue was found to be dense and infiltrated, so that the attempted inspection was fruitless, though the probe could be passed under it without difficulty. The visible cornea appeared normal. The eye was in the greatest jeopardy from a threatened Sæmisch (crescentic) ulcer, so common in these cases.

The history of the discussions concerning the etiology of these ulcers present two leading theories, following which the plans of treatment would be almost diametrically opposed. According to the older hypothesis, the ulceration and gangrene of the cornea is due to the swelling and infiltration of the tissue about the cornea preventing its nutrition, by interfering with the surrounding circulation, and also by the superimposed pressure of the swollen lids and infiltrated tissue. Accepting this position, the treatment has been to divide the tissues and relieve the tension and pressure. Canthoplasty is recommended, and it has been proposed to divide the upper lid vertically, and with sutures through the free angle and plasters to the forehead, retain the two halves of the lid in a permanently inverted position, until the danger of corneal complication was over.

The advocates of the other and more recent hypothesis, assume the position that these ulcers and corneal destructions are due to the invasion of septic and specific agencies between the layers of the cornea, and that the multiplication of these micro-organisms establishes suppurative processes, the natural history of which is so familiar to all students in this department of medicine. Actuated by this latter hypothesis, the reasons for which cannot be given in this limited space, it was determined not to make any incision, but to rely solely on an antiseptic line of treatment. Cold, according to comfort, was fortified by the insufflation of *pulverized* iodoform twice a day, and after each application a few drops of peroxide of hydrogen were injected between the lids with a pipette, and the lid quickly closed upon its withdrawal. In contact with the pus, the oxygen was immediately liberated in volumes sufficient to fill and distend the entire conjunctival sac, and presumably force the iodoform into, and the pus out of all the conjunctival folds and recesses, and effectually antagonize, for the time, the specific condition of the entire mucous tract. After each application, the matter was removed from the edges of the lid by absorbent cotton, a drop of a one per cent. solution of atropia applied, and the eye covered with a pledget of absorbent cotton soaked in a 25 per cent. aqueous dilution of laudanum, and changed according to the inclination of the patient. After each treatment there was a feeling of comfort and freedom from pain, and his condition did not get worse from the commencement of the treatment. Upon about the eighth day, the swelling having abated considerably, it was possible to inspect the cornea, and one may imagine my surprise on finding a deep crescentic excavation of the cornea extending through ninety degrees of its circumference, and presenting every appearance of healing, which went on without interruption to final and complete recovery.

I do not present this recovery from a most critical and andgerous state (even worse than was anticipated) as a demon-

stration of a generality, but as a suggestion, based on further experience with gonorrhœal ophthalmia and ophthalmia neonatorum, which may possibly be welcome to some, who, like myself, had come to believe that the heroic treatment of incision and caustic solutions is not the only and, perhaps, not the best way of treating these grave affections of the eye.

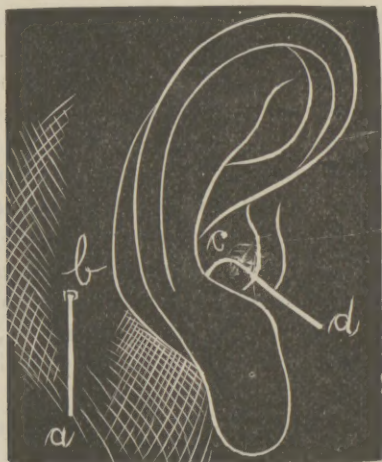
I have no fault to find with Sæmisch section in crescentic ulcer, for in numerous cases have I felt that the salvation of a threatened eye was due to it; but looking back on this case, it appears difficult to conceive how the operation could have been made with success, or made at all, had one been aware of the presence of the ulcer, for the infiltrated and overhanging mass was so dense and inflexible as to preclude inspection. In just such cases, at least, do we feel assured that it would be impossible to obtain with any known agent, what is so elegantly, painlessly and efficiently accomplished by the partnership of the non-irritating antiseptics, *iodoform* and *hydrogen-dioxide*.

For another illustration of this unique quality of peroxide of hydrogen, mention will be briefly made of its application in a case of mastoid abscess, which came under my observation in May, 1883.

CASE II.—Julia, 8 months old, daughter of Dr. P., Manchester, Ill. Suppuration following scarlatina had existed about ten weeks, when the mastoid became invaded and continued to grow worse, until it assumed a serious aspect with marked symptoms of septic poison. When it came under observation the child had become much emaciated with continued fever and loss of appetite. Examination revealed absence of the drum membrane, exceedingly offensive pus, granulations in the tympanic cavity, with swelling, redness and heat over the mastoid. These symptoms established the presumption, if not the certainty, that the disturbance was caused by a quantity of confined and fetid pus, somewhere among the mastoid cells. Acting on this conception of the case, a drill was passed through the mastoid directly into the tympanic cavity. A fenestrated cataract spoon was then placed in the drum cavity, with the opening in the line of the direction of the drill, which was then withdrawn, and a flexible lead wire passed along its track until the end reached the fenestrum of the spoon, by the removal of which its extremity was directed into the meatus. By the aid of the angular forceps, it was then easily drawn out and turned down on the cheek, as seen in Fig. 1. It was now possible, through the cutaneous opening (*b*) in the mastoid, to inject antiseptic solutions which escaped from the external meatus (*c*). This usually successful manœuvre failed

to remove the source of irritation, which being a cavity of pus out of the line of the drainage wire (see cut) there was no opportunity for the liquid medicament to find entrance and expel it.

Fig. 12.



Having learned of the peculiar property of peroxide of hydrogen, this seemed to be a case for demonstrating its superiority, and without knowing any precedent for the proceeding, the capacity of my hypodermic syringe was injected by the side of the lead wire, the finger of the remaining hand being held over the external meatus. Upon withdrawing the syringe, and preventing the escape of the liquid, the liberated oxygen must have penetrated every accessible recess of the mastoid cells, with the same force that caused it to boil out of the external openings, baffling all efforts to restrain it. The conduct of the agent was in every respect satisfactory, and the quantity of pus dislodged by this tumultuous effervescence proved it to have reached the seat of trouble, and the intimate mixture of gas and pus, which appeared as a yellow froth at the points of escape, reminds us of its behavior under the microscope, where it is seen that no cell escapes its disturbing action. By repeated injections, so long as any pus remains, the oxygen will continue to be liberated; hence by the absence of the evolution of gas, an evidence exists that the cavity is completely empty, and the surface freed from the presence of pus. The constitutional symptoms commenced forthwith to improve, and the case went on to final recovery with no other than the usual treatment with boric acid, finely powdered, *without glycerine*, blown into the ear with a quill and packed, after first thoroughly cleansing and drying, and this alternated with the strongest obtainable alcohol for toughening the mucous membrane and causing the shrinkage of the granulations.

Submitting this index to the possibilities of this invaluable agent, the appended references may be of value to any who desire to investigate the subject to which the above is but an inadequate introduction.*

On leaving this subject, we desire to acknowledge our obligation to G. V. Black, D. D. S., Jacksonville, and A. W. Harlan D. D. S., Chicago, who have used this agent extensively, and through whom was made known to us this inestimable quality in which the septic microbe finds a potent antagonist.

*Peroxide of hydrogen in dentistry, by A. W. Harlan, D. D. S., *Independent Practitioner*, March, 1883.

Transactions of International Medical Congress, 1881, Vol. III., A. W. Coffin.

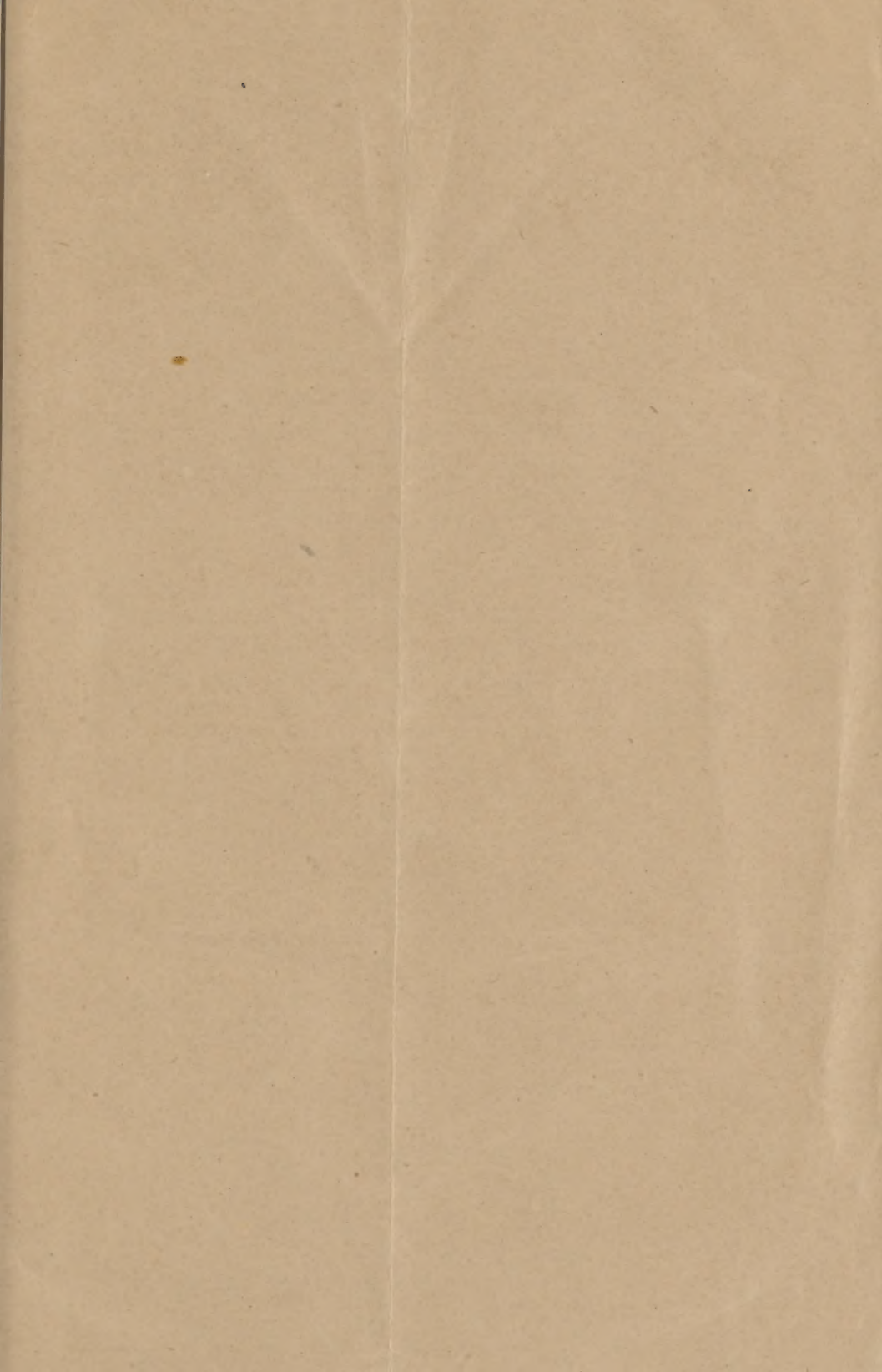
Peroxide d'Hydrogene, by P. Bert and Regnaud. *Trans. of Academie des Science*, 1881-82.

Also *Journal de Medicine de Paris*, for 1882-83, has numerous references.

Peroxide of Hydrogen in contagious ophthalmia by LeRoy Walker, M. D., *New York Medical Record*, Aug. 25, 1883.

Peroxide d'hydrogene, by Dr. A. Aubean in *L'Odontologie*, Aug., 1882, translated by A. W. Harlan, Chicago, for *Ohio State Journal of Dental Sciences*, Feb., 1883.

Without the association of pulverized iodoform, favorable experience with hydrogen peroxide has been recorded in the eye clinics of Wecker and others, of Paris.



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